PATENT
Customer No. 28289
Attorney Docket No. 4623-045789

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)
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Robin John Batterham et al.	) Group Art Unit: 1793
	)
Application No.: 10/516,431	) Examiner: Tima M. McGURTHRY-BANKS
	)
Filed: August 31, 2005	)
	)
For: MICROWAVE TREATMENT OF ORES	) Confirmation No.: 2821
	)
	)
	)

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

DECLARATION UNDER 37 C.F.R. § 1.132

I, Raymond Walter SHAW, do hereby make the following declaration:

1. I am one of the inventors of the above-identified United States application.

2. I am currently employed by Technological Resources Pty Ltd, which is the assignee of the inventors, and is a wholly owned subsidiary of Rio Tinto Limited.

3. I have reviewed pending claims 1-4, 9-17, 19, 20, 22, 23, and 25-27. In addition, I have reviewed the Office Action dated December 28, 2007, which issued on this application.

4. It has been explained to me that the Patent Office has rejected claims 1-3, 6, 9,-12, 16, 20, 23, and 25-27 under 35 U.S.C. § 103(a) as being unpatentable over International publication WO 92/018249 to Beeby. ("Beeby) and claims 4 and 13-15 under 35 U.S.C. § 103(a) as being unpatentable over Beeby as applied to claims 1 and 12 in view of an article by Kazi Haque ("Haque").

5. I have reviewed Beeby and Haque.

6. The above-identified United States patent application relates to a method of treating ore particles to facilitate subsequent processing of the ore particles to recover valuable components from the ore. A key feature of the method is the use of short duration pulses of microwave energy.

7. I set out below claim 1 of the above-identified United States patent application for convenient reference:

"*A method of treating ore particles to facilitate subsequent processing of the ore particles to recover valuable components from the ore, including the steps of: providing ore particles with a major dimension of 15 cm or less and exposing the ore particles to pulses of microwave energy, each pulse being less than 1 second, and causing structural alteration of the ore particles without significantly altering the mineralogy, i.e. composition, of the ore, the structural alteration of the ore particles being a result of differences in thermal expansion of minerals within the ore particles, as a consequence of exposure to microwave energy, resulting in regions of high stress/strain within the ore particles and leading to micro-cracking or other physical changes within the ore particles.*"

8. The Office Action indicates that the Patent Office considers that there is an overlap between the pulse duration of the method of subject claim 1 and the pulse duration of the method disclosed in Beeby. Claim 1 defines a pulse duration of <u>less</u> than 1 second. As is mentioned in the Office Action, Beeby discloses a pulse duration of 1 to 30 seconds. There is <u>no</u> overlap between these ranges of pulse durations. The ranges are quite distinct and the non-overlapping ranges are an important difference between the claims method and the disclosure in Beeby, as will be evident from the following sections of this declaration.

An important requirement of claim 1 is that the pulses of microwave energy cause "*structural alteration of the ore particles*" that is "*a result of differences in thermal expansion of minerals within ore particles*" and "*resulting in regions of high stress/strain within the ore particles*". In other words, the claimed method requires that the ore particles respond differently to pulsed microwave energy in order to cause the differential thermal expansion and resultant high stress/strain regions. The short duration, i.e. less than 1 second, pulses of the claimed method are an important factor in achieving this differential thermal expansion and resultant high stress/strain regions. Beeby does not recognise the importance of short duration pulses.

9. The short duration pulses are essential to achieve very rapid differential heating between the susceptor minerals, such as chalcopyrite and chalcocite, and the other constituents of ore particles present to generate high stresses and cause breakage. These short duration pulses allow very high energy microwaves to be provided to the susceptor minerals which maximizes their expansion compared to the non susceptor minerals which they are in contact with and therefore maximises the stresses generated. This cannot be achieved using the longer pulses, and extended exposure times, as disclosed by Beeby, as the minerals become overheated and change composition and can even melt causing subsequent processing difficulties. With some minerals the heat transfer between the different phases is sufficiently rapid that with longer low energy pulses the stresses alleviate without microcracks forming. This ability to generate high stresses with very short pulses and the importance of the energy level was an unexpected finding for me and is not disclosed by Beeby who teaches that the most important factor is the overall level of exposure of the ore through a combination of long duration pulses, greater than 1 second, and extended exposure of up to 1 hour and preferably between 5-40 minutes.

10. Subject claim 4 defines that the method of claim 1 further includes screening ore particles prior to exposing the particles to microwave energy in order to remove fines from the ore particles. In other words, the claimed method operates with coarse particles. This is an important difference between the claimed method and the disclosure in Beeby. The Beeby process operates with fines rather than without fines - see the particle size distribution in Table 2 on pages 5 and 6 of Beeby – the particle size distribution is predominantly fines. The particle size distribution is for the particles tested in the experimental work reported by Beeby. The Office

Action acknowledges that Beeby does not disclose screening out fines. However, the Patent Office argues (based on the disclosure in Haque) that particle size is "*recognized in the art as a result effective variable*" and would have been optimized in the Beeby process "*as a matter of routine investigation*". Beeby relies on operating with fines – from the viewpoint of Beeby, the process is optimized with respect to particle size. For example, the Beeby abstract describes that the process comprises a gold-bearing ore so that up to 95% of the ore passes a 2 mm (i.e. 0.2 cm) screen and then exposing these particles to pulses of microwave energy. Particles that pass a 2 mm screen are properly describes as fines. Beeby screens fines in for further processing. Subject claim 4 screens fines out for further processing. Beeby deliberately operates with fines. It would not be obvious to modify the teaching of Beeby to operate the Beeby process with coarser, i.e. non-fines, particles.

11. The subject invention works more effectively on larger particle sizes than on fines. The claimed method forms microcracks. Fines are considerably less likely to fracture than larger particles when subjected to short duration pulsed microwave energy and therefore where the target of the microwave application is microcracking I have found the system is more effective if fines are removed prior to microwave exposure rather than allowed to remain in or even added as in the case of Beeby.

12. The Beeby disclosure that the material should be exposed to the microwave pulses for extended periods of up to one hour and preferably for between 5-40 minutes also teaches against the unexpected result found by mer that very short exposure to one or more high energy pulses is the most effective way of generating microcracks to help in further processing. The other inventors and I found that the short duration pulses enable the application of the microwaves in a "flow-through" system such as falling through a chute or on a conveyor belt unlike the Beeby system where the material is kept within the microwave furnace for an extended time.

13. The emphasis of the subject invention on larger particle sizes than fines is evident from the description of the embodiment in the subject specification. With reference to page 10, line 1 and following, copper-containing ore particles are supplied to a primary crusher and are crushed to a particle size of 10-15 cm. Particles of this size are not fines. The particles are exposed to pulses of high energy microwaves. The microwave energy causes localised heating of the

susceptor components of the ore (such as chalcopyrite and chalcocite) and the differences in thermal expansion of the constituents of the ore produces regions of high stress/strain within the ore particles and causes microcracks to form in the particles, particularly the copper-containing chalcopyrite and chalcocite particles. Typically, the input feed of 10-15 cm particles will be broken down into a stream of 1-15 cm particles, with a substantial proportion of the output being larger than 5 cm – these input and output particle size ranges are not fines.

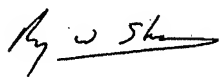
14. Claim 6 defines that the microwave energy in the pulses in the method of claim 1 are "*high energy*". Page 5, lines 29-31 of the specification defines "*high energy*" as energies substantially above those within conventional household microwaves, i.e. substantially above 1 kW. Beeby does not cite the energy of the microwaves as important and the data in Figures 2 and 3 are only for considerably lower energies being 650 W and 1300 W. These are not high energies. In example 2 higher energies of 7.5kW were used at a different frequency and with much more material present in the apparatus but were not reported to show any improvement over the lower energy work and indeed the main conclusion drawn from this work was that changing the frequency used did not alter the results. Operating at lower energies is necessary for Beeby – operating at longer pulse durations than the claimed method and at high energies would overheat the fines that are treated deliberately by Beeby and change the minerology of the particles and be undesirable in terms of further processing to recover valuable metals. The need to operate at lower energies is evident in the paragraph bridging pages 8 and 9 of Beeby. This paragraph describes that samples with the "*highest microwave energy processing*" produced a plasma that caused particles to fuse together and resulted in lower gold extraction in subsequent processing. The method of subject claims 1/6 and, in particular, subject claims 1/4/6, teaches high energy, short pulse duration microwave treatment of coarse, i.e. non-fines, particles. This is a completely different method to the low energy, longer pulse duration treatment of fines disclosed by Beeby. There is no basis to modify the Beeby process in any way to comprise the claimed method.

15. I declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further, that the statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such wilful false

statements may jeopardize the validity of the application or any patents issuing thereon.

Dated: **July 26th 2008**

By:



Raymond Walter SHAW

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